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February 9, 2012

VIA ECFS

Jennifer Manner
Deputy Bureau Chief
Public Safety Homeland Security Bureau
Federal Communications Commission
445 12th Street S.W.
Washington, D.C. 20554

Dear Ms. Manner:

On Monday, February 6, 2012, the State of Texas ("State"), Motorola Solutions, Harris County ITS and FCC PSHSB teams participated in a conference call during which you requested specific clarifications regarding the *Texas Interoperability Showing, v9* and the previously submitted application for a temporary license.

In the document attached, the State is providing the clarifications to the questions posed by your team summarized by topic and in bullet point format, as you requested. This document will be accompanied by a modified temporary license application which will follow in short order.

Once again, we greatly appreciate your partnership and support as we eagerly endeavor to move purposefully toward an authorized date of serviceability for the Harris County BIG-Net system. As we work more closely with our end users, we are even more energized by the vast potential Public Safety LTE technologies can deliver for Public Safety in better enabling them with state-of-the-art technologies to allow them to better protect and serve our citizenry.

Please don't hesitate to contact us if you have additional questions.

Respectfully submitted for the State of Texas,

/s/ Todd M. Early
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cc: (via email)
        Adm. James Barnett   Behzad Ghaffari   Brian Hurley
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Texas Interoperability Showing, v9 Clarification Responses to Questions Posed by FCC PSHSB Team on February 6, 2012 Conference Call

Submission Date: February 9, 2012

Topic: Interoperability Between User Equipment and eNodeBs of Different Manufacturers

- To achieve interoperability between the enhanced Node B site equipment (eNBs) and User Equipment (UEs) from different manufacturers, the State of Texas relies upon the robust commercial implementations of the 3GPP air interface standards and the rich commercial LTE technology ecosystem.
- In order to maintain compliance with FCC orders, the State of Texas PS LTE program will require that the infrastructure and UEs are compliant to the 3GPP interfaces and that the vendors provide documentation showing successful completion of:
  - o PCS-Type Certification Review Board (PTCRB) testing for all Band 14 PS LTE devices which will operate on a State of Texas PS LTE network.
  - o Public Safety Communications Research PSCR 700 MHz Demo program testing
- One of the strategies being developed by the State of Texas is an initial interoperability test and validation project. Network vendor teams are actively working on a solution which will utilize direct connectivity over secure VPN tunnels, a test of IMSI-level routing, and the use of User Equipment devices configured to enable access of visited UEs to Common APNs on the Harris County BIG-Net system.
- The State of Texas will further demonstrate interoperability with other Petitioners via Sub-Network interconnectivity as outlined in Appendix I of the *Texas Interoperability Showing, v9* document.

Topic: Scope of Services Provided Between Interconnected, Interoperating Systems

- The scope of interoperability and services between interconnected PS LTE Sub-Networks include:
  - o **Attach UE to another vendor's eNB using the Uu Interface** – Achieving a successful UE attach verifies the interoperability between the UE and eNodeB via the (Uu) 3GPP air interface.
  - o **Authentication and Service Establishment over the S6a interface** – Enabling a visiting UE to authenticate to their Home network and establish service by providing interconnectivity over the 3GPP S6a interface between the visited MME and Home HSS. Because PS LTE Sub-Networks will use the common PLMN ID, this service requires IMSI-level routing.
  - o **Service Establishment using Local PGW Access (LPA)[1]** – Enables a visiting UE to access a Common APN on the visited ("local") network. Achieving service availability via LPA

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[1] Because the PS LTE Sub-Networks use a Common PLMN ID and therefore do not need 3GPP "roaming", the Local PGW Access (LPA) service term is used instead of the LTE roaming term, Local Breakout (LBO).

verifies interoperability of the HSS in the home network with the MME in the visited network via the S6a interface.

- o **Service Establishment using Home PGW Access (HPA)[2] over the S5[3] interface** – Enables a visiting UE to access a Harris County APN residing on the home network. Achieving service availability via HPA verifies interoperability of the PGW in the home network with the SGW in the visited network via the S5 interface.

The above services will be deployed and enabled as specified by the requesting petitioner with a minimum interoperable functionality defined as UE attach, authentication, and LPA using a Common APN.

Topic: High Level View of How Interoperability Validation Testing Will Be Performed

The State of Texas is providing a high level view of the Validation Testing Plan to provide additional detail as to how the services will be tested and validated. Because many aspects depend upon the "interconnecting Petitioner" entity requesting interconnectivity, the type of equipment they will be using, and the objectives of the tests being implemented, various details are provided as options.

The high-level Interoperability Validation Test plan is as follows:

Network Interconnect Setup & Configuration
- Nationally assigned Big-Net IMSI ranges are configured into BIG-Net MME & HSS
- Interconnecting Petitioner nationally assigned IMSI ranges are configured into Interconnecting Petitioner MME & HSS
- BIG-Net Diameter Realm configured into BIG-Net MME & HSS
- Interconnecting Petitioner Diameter Realm configured into Interconnecting Petitioner MME & HSS
- Common APN configured into BIG-Net and Interconnecting Petitioner UEs (if required)
- Common APN configured into BIG-Net and Interconnecting Petitioner MME, HSS, and PGWs
- Implementation of physical connections between BIG-Net and Interconnecting Petitioner EPC Data Centers OR vendor labs using VPN connections through Internet OR private line connections

Network & UE Interfaces
- S6a interface between EPCs under test
- Uu interface via cabled RF link or RF airlink between UE and eNB
- S5 interface between visited SGW and home PGW (HPA only)

UE types & Configuration
- BIG-Net test UE will likely be a USB modem
- Interconnecting Petitioner UE will be USB modem OR Vehicular modem, preferably from a different manufacturer than the BIG-Net UE
- HSS subscription record will be configured with the Common APN

Test Cases & Evaluation Criteria
- Verify LPA for BIG-Net UE on Interconnecting Petitioner EPS

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[2] Because the PS LTE Sub-Networks use a Common PLMN ID, the LPA services is supported instead of the LTE roaming equivalent called Home Routing.

[3] Similarly, S5 is the SGW to PGW interface used between Sub-Networks instead of S8 used when interconnecting networks of different PLMN IDs.

      a. Power-up properly configured BIG-Net UE in location with good RF signal from Interconnecting Petitioner eNB

      b. Verify that BIG-Net UE successfully attaches to Interconnecting Petitioner EPS[4]

      c. Verify that BIG-Net UE successfully sends and receives ping request and response to and from a server provisioned in a data network associated with the configured Common APN

- Verify LPA for Interconnecting Petitioner UE on BIG-Net EPS

      d. Power-up properly configured Interconnecting Petitioner UE in location with good RF signal from BIG-Net eNB

      e. Verify that Interconnecting Petitioner UE successfully attaches to BIG-Net EPS

      f. Verify that Interconnecting Petitioner UE successfully sends and receives ping request and response to and from a server provisioned in a data network associated with the configured Common APN

- Upon receiving a request from an Interconnecting Petitioner, the State of Texas commits to communicating the test plan in the subsequent Quarterly Report, and will also certify that the tests were successfully completed in the first Quarterly Report subsequent to the successful completion of the validation testing.

Topic: Commitment to Verifying Interoperability of Multiple UE Manufacturers Equipment

- As an Early Adopter entity committed to pioneering multi-vendor interoperability, Harris County BIG-Net and the State of Texas agree to take on the challenge of interoperability of multiple manufacturers' User Equipment on the BIG-Net system. This will be accomplished through one or a combination of the following approaches: testing initiated from a request from an Interconnecting Petitioner to operate Band 14 UEs which are from different manufacturer(s) than those being deployed by Harris County; a lab-based multi-vendor UE-eNB interoperability validation testing, as described below; or an interoperability validation test of multiple manufacturers' UEs on the Harris County BIG-Net system as described in the previous section.

- The proceeding strategy will be further reinforced by IOT programs employed by the current Harris County vendor such as:

    o PTCRB certification complying with FCC Order 10-2342

    o PSCR Demo Network participation complying with FCC Order 10-79

- If specific UE types require additional testing, it may be possible to utilize the internal product-development and specific certification programs established by the UE manufacturer. Example testing situations are:

    o Commercial carrier certifications, which may also include testing with eNBs from multiple vendors

    o Vendor-specific ecosystem IOTs, which may include chip-level and eNB-level IOT from multiple suppliers

- The State of Texas commits to communicating UE IOT status in the future Quarterly Reports, and will also certify that the tests were successfully completed in the first Quarterly Report subsequent to the successful completion of these IOT activities.

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[4] An Enhanced Packet System (EPS) is comprised of eNBs and an EPC.

Topic: Support Requests from Public Safety Sub-Network Operators ("Petitioners") for Interoperability with Same or Other EPC Manufacturers' Equipment

- Per the process outlined in section B.2 of the Texas Interoperability Showing, the State of Texas will be capable of accepting requests from any Petitioner interested in interconnecting and interoperating with the Harris County BIG-Net system.

- The State of Texas also commits to implementing the capability to establish working interconnectivity with the services and capabilities outlined in the Showing and further clarified herein. The process will be initiated with a request from the Petitioner, reviewed by the State of Texas and the State will initiate negotiation of an agreement and implementation plan. If for any reason the parties cannot come to an agreement within 90 days, the Bureau will be notified.

- The State of Texas commits to communicating the status of Petitioner requests in future Quarterly Reports which will include: what requests have been received, status of the agreements, scope of the interconnectivity services requests, and plans for supporting the interconnectivity once the agreement and deployment plan is established. Also, in the first Quarterly Report following the date of service availability, the State will submit an Interoperability Test (IOT) plan to the Bureau.[5]

Additional Clarification for the Texas Interoperability Showing, v9, Section H.2.4

Section H.2.4 should have included the site location information for the "College Station" site corresponding to the coverage maps shown in section H.2.5. The College Station site will be deployed at Kyle Field stadium which has a capacity to hold 83,000 people. The PS LTE BIG-Net service will deliver dramatic Public Safety benefits and operational value by providing enhanced Public Safety services while avoiding the severe congestion typically experienced on commercial cellular systems which are simply not designed to provide assured services for such large concentrations of users in a small, compact area.

The site location for the Kyle Field Site in College Station, Texas is provided below.

Site Name	Latitude	Longitude
Kyle Field	30 36 33.40 N	96 20 30.10 W

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[5] *See Interoperability Waiver Order*, DA 10-2342, ¶E